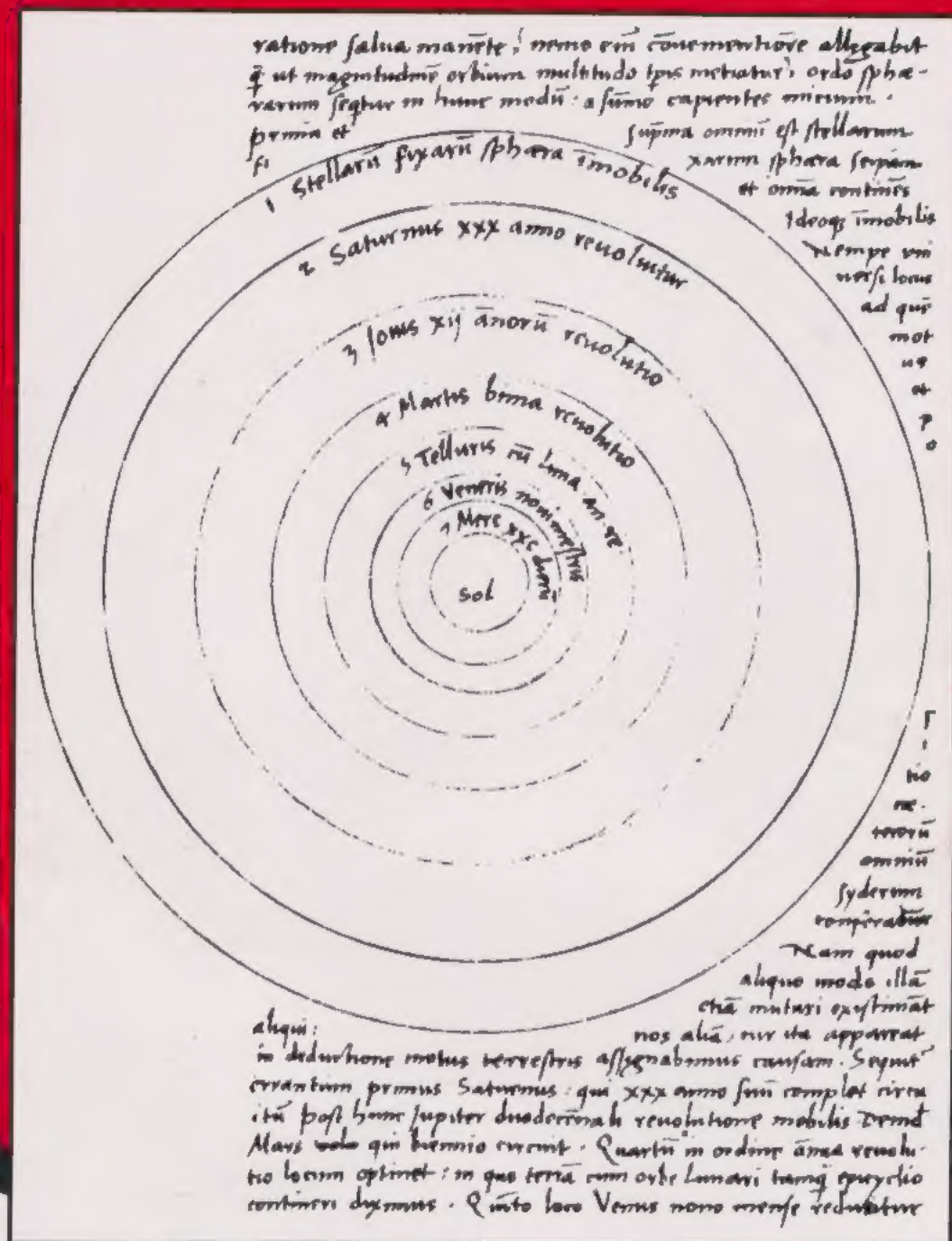


SCIENCE



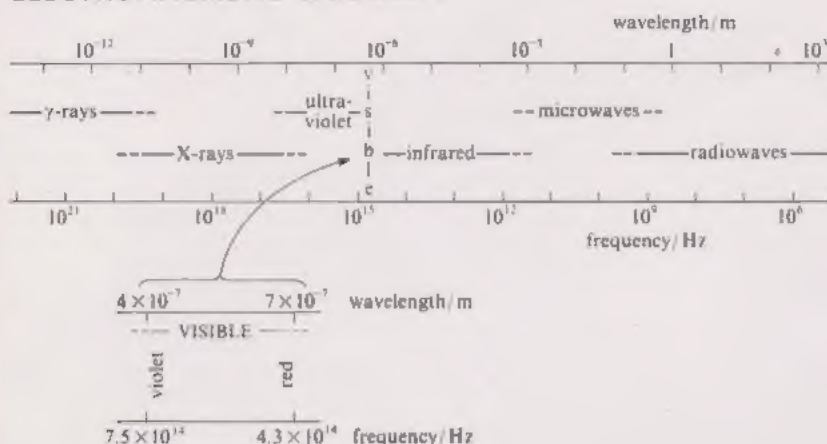
Unit 1
Science and the planet Earth

Unit 2
Measuring the Solar System

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USEFUL INFORMATION FOR THE PHYSICS AND GENERAL SCIENCE UNITS

ELECTROMAGNETIC SPECTRUM



PHYSICAL CONSTANTS

Symbol	Quantity	Approximate value
G	gravitational constant	$6.672 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
c	speed of light in a vacuum	$2.998 \times 10^8 \text{ m s}^{-1}$
h	Planck's constant	$6.626 \times 10^{-34} \text{ J s}$
e	magnitude of the charge of the electron	$1.602 \times 10^{-19} \text{ C}$
m_e	mass of the electron	$9.110 \times 10^{-31} \text{ kg}$
m_n	mass of the neutron	$1.675 \times 10^{-27} \text{ kg}$
m_p	mass of the proton	$1.673 \times 10^{-27} \text{ kg}$

USEFUL QUANTITIES AND CONVERSIONS

$\pi \approx 3.142$	Earth radius (equatorial) $\approx 6.38 \times 10^6 \text{ m}$
1 mile $\approx 1.609 \text{ km}$	circumference of the Earth (distance round the Equator) $\approx 4.01 \times 10^7 \text{ m}$
1 kilometre (km) $\approx 0.6214 \text{ mile}$	radius of the Moon $\approx 1.74 \times 10^6 \text{ m}$
1 inch = 2.54 cm	radius of the Sun $\approx 6.96 \times 10^8 \text{ m}$
1 centimetre (cm) $\approx 0.3937 \text{ inch}$	Earth-Sun distance (i.e. orbital radius of the Earth) $\approx 1.50 \times 10^{11} \text{ m}$
1 kilocalorie $\approx 4187 \text{ J}$	Earth-Moon distance (i.e. orbital radius of the Moon) $\approx 3.84 \times 10^8 \text{ m}$
1 electronvolt (eV) $\approx 1.602 \times 10^{-19} \text{ J}$	
1 radian $\approx 57.296 \text{ degrees}$	
1 degree $\approx 0.01745 \text{ radian}$	
1 GeV/ $c^2 \approx 1.783 \times 10^{-27} \text{ kg}$	

SI02 UNITS

1 Science and the planet Earth	19 Life and evolution
2 Measuring the Solar System	20 Inheritance and cell division
3 Motion under gravity	21 Genes and evolution
4 Practical work in science	22 Biochemistry
5-6 Into the Earth: earthquakes, seismology and the Earth's magnetism	23 Physiology
7-8 Plate tectonics: a revolution in the Earth sciences	24 DNA: molecular aspects of genetics
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10 Modelling the behaviour of light	26 Biology reviewed
11-12 Atomic structure	27 Earth materials and processes
13-14 Chemical reactions and the Periodic Table	28-29 Geological time and Earth history
15 Chemical equilibrium	30 Quantum mechanics: an introduction
16 Chemical energetics	31 Quantum mechanics: atoms and nuclei
17-18 The chemistry of carbon compounds	32 The search for fundamental particles



SCIENCE

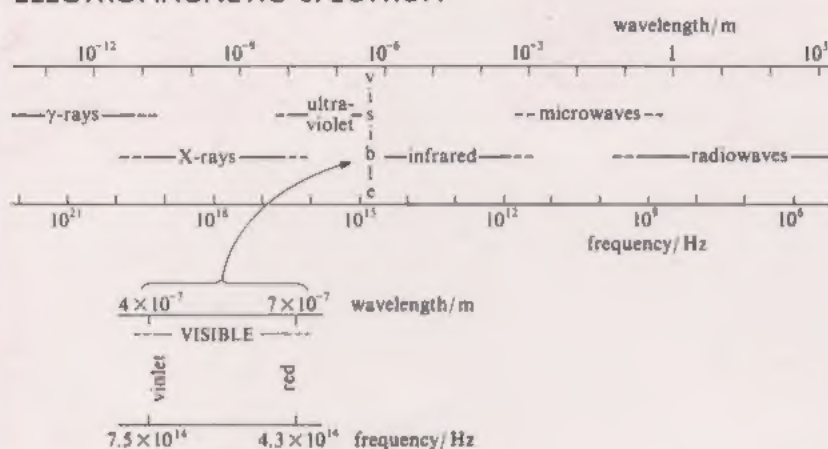


Unit 3
Motion under gravity

Unit 4
Practical work in science

USEFUL INFORMATION FOR THE PHYSICS AND GENERAL SCIENCE UNITS

ELECTROMAGNETIC SPECTRUM



PHYSICAL CONSTANTS

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16	Chemical energetics	31	Quantum mechanics: atoms and nuclei
17-18	The chemistry of carbon compounds	32	The search for fundamental particles

S102 UNITS 5-6

THE OPEN UNIVERSITY
S102: A SCIENCE FOUNDATION COURSE

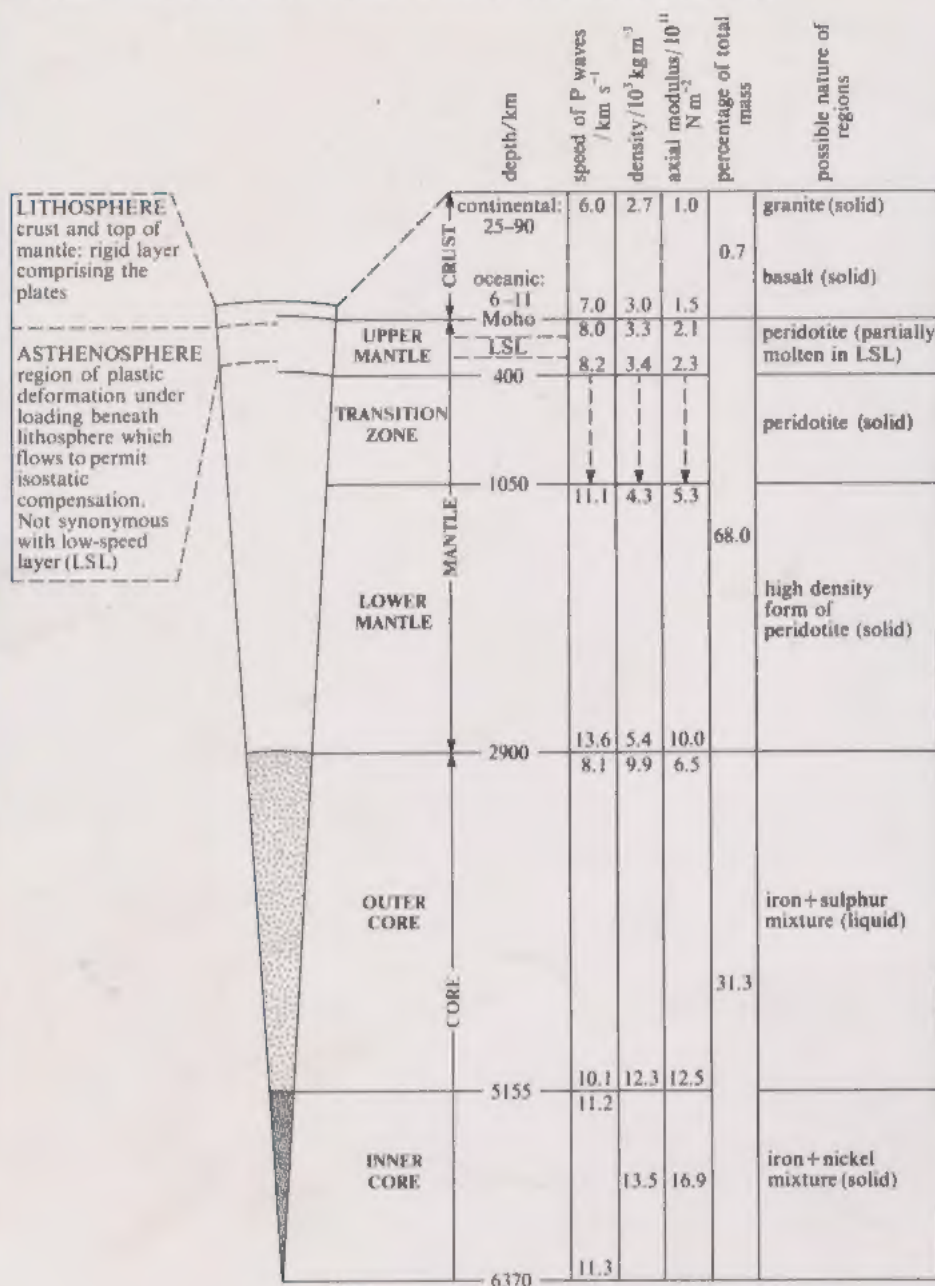


SCIENCE



Units 5-6
Into the Earth: earthquakes,
seismology and the Earth's magnetism

PROPERTIES OF THE EARTH'S INTERIOR



S102 UNITS

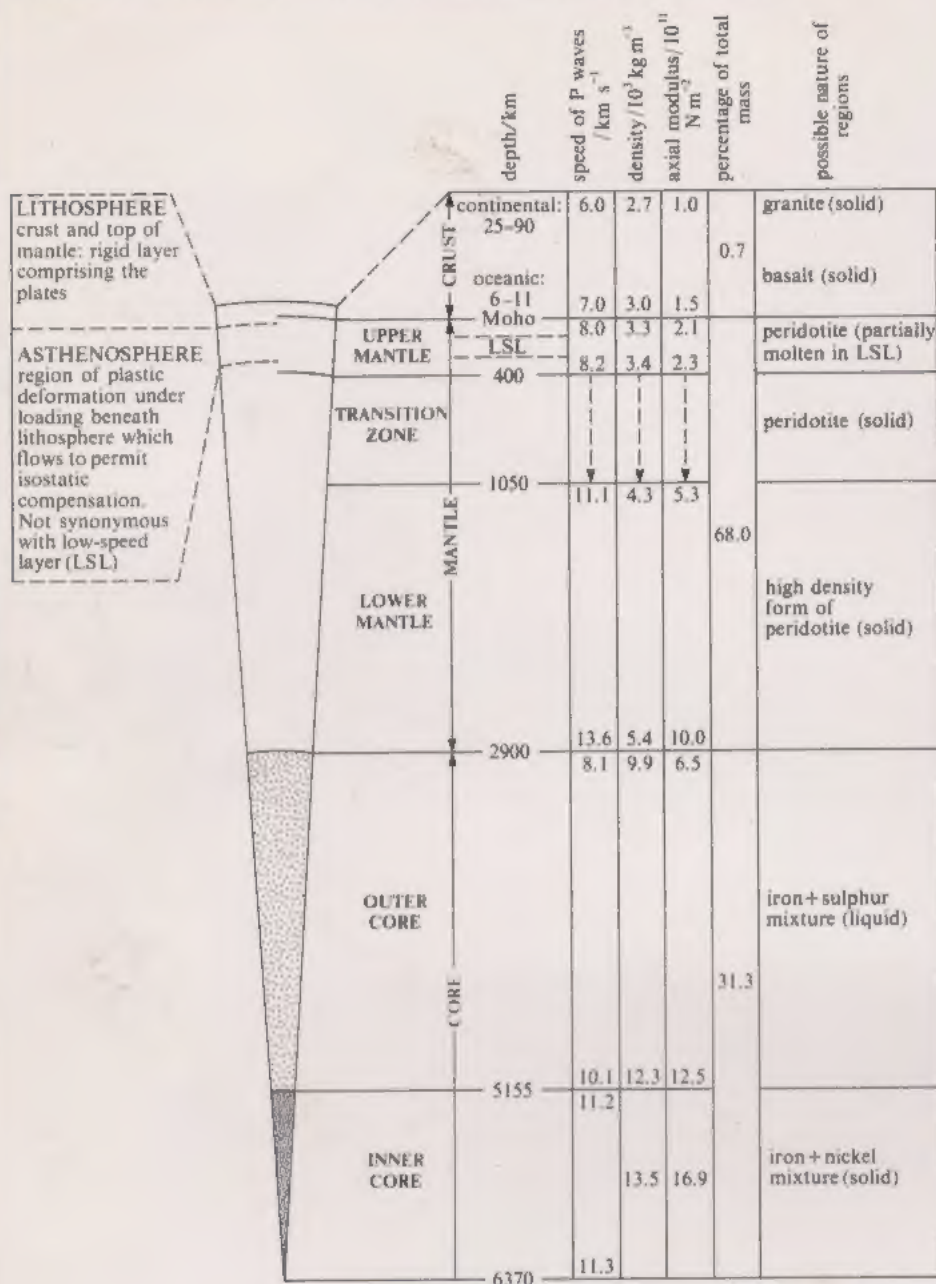
- | | |
|---|---|
| 1 Science and the planet Earth | 19 Life and evolution |
| 2 Measuring the Solar System | 20 Inheritance and cell division |
| 3 Motion under gravity | 21 Genes and evolution |
| 4 Practical work in science | 22 Biochemistry |
| 5-6 Into the Earth: earthquakes, seismology and the Earth's magnetism | 23 Physiology |
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| 13-14 Chemical reactions and the Periodic Table | 28-29 Geological time and Earth history |
| 15 Chemical equilibrium | 30 Quantum mechanics: an introduction |
| 16 Chemical energetics | 31 Quantum mechanics: atoms and nuclei |
| 17-18 The chemistry of carbon compounds | 32 The search for fundamental particles |

SCIENCE



Units 7-8
Plate tectonics:
a revolution in the Earth sciences

PROPERTIES OF THE EARTH'S INTERIOR



SI02 UNITS

- | | |
|---|---|
| 1 Science and the planet Earth | 19 Life and evolution |
| 2 Measuring the Solar System | 20 Inheritance and cell division |
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SCIENCE

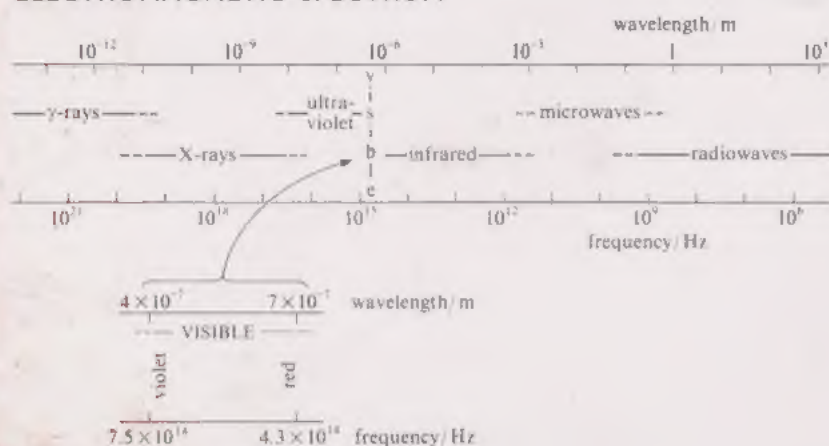


Unit 9
Energy

Unit 10
Modelling the behaviour of light

USEFUL INFORMATION FOR THE PHYSICS AND GENERAL SCIENCE UNITS

ELECTROMAGNETIC SPECTRUM



PHYSICAL CONSTANTS

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15	Chemical equilibrium	30	Quantum mechanics: an introduction
16	Chemical energetics	31	Quantum mechanics: atoms and nuclei
17-18	The chemistry of carbon compounds	32	The search for fundamental particles



SCIENCE



Units 11–12
Atomic structure

THE PERIODIC TABLE

I	II											III	IV	V	VI	VII	0
																	He
1	4											5	6	7	8	9	10
Li	Be											B	C	N	O	F	Ne
11	12											13	14	15	16	17	18
Na	Mg											Al	Si	P	S	Cl	Ar
19	20																
K	Ca																
37	38																
Rb	Sr																
55	56	lanthanides															
Cs	Ba																
87	88	actinides															
Fr	Ra																
transition elements																	
typical elements																	
lanthanides																	

SI02 UNITS

1	Science and the planet Earth	19	Life and evolution
2	Measuring the Solar System	20	Inheritance and cell division
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		24	DNA: molecular aspects of genetics
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15	Chemical equilibrium	31	Quantum mechanics: atoms and nuclei
16	Chemical energetics	32	The search for fundamental particles
17-18	The chemistry of carbon compounds		



SCIENCE



Units 13–14
Chemical reactions
and the Periodic Table

2

transition elements

- typical elements

lanthanides

La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb
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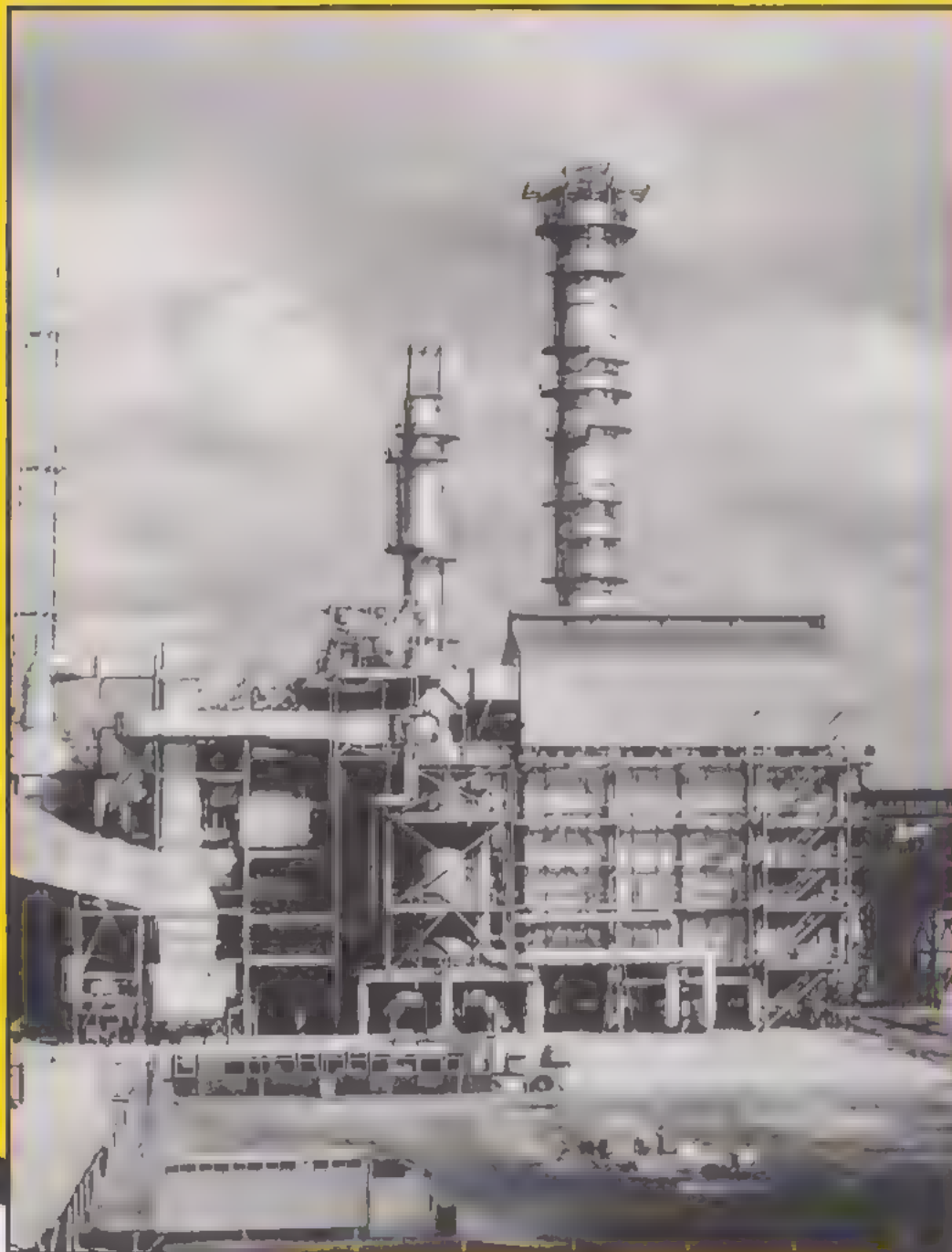
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actinides

- Life and evolution
- Inheritance and cell division
- Genes and evolution
- Biochemistry
- Physiology
- DNA: molecular aspects of genetics
- Ecology
- Biology reviewed
- Earth materials and processes
- 29 Geological time and Earth history
- Quantum mechanics: an introduction
- Quantum mechanics: atoms and nuclei
- The search for fundamental particles



SCIENCE



Unit 15
Chemical equilibrium

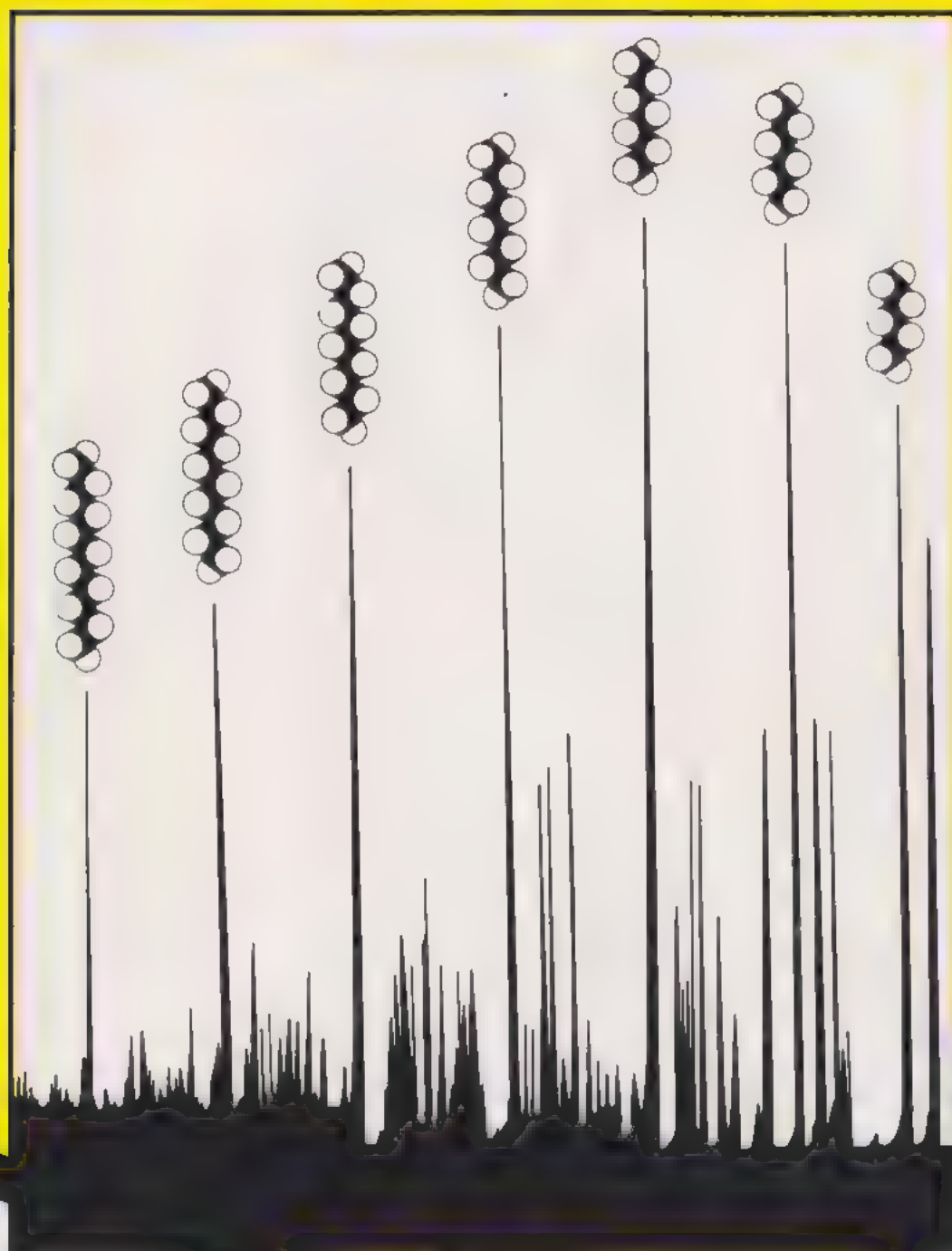
Unit 16
Chemical energetics

THE PERIODIC TABLE

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SCIENCE



Units 17–18
The chemistry of
carbon compounds



SCIENCE



Unit 19
Life and evolution

Unit 20
Inheritance and cell division

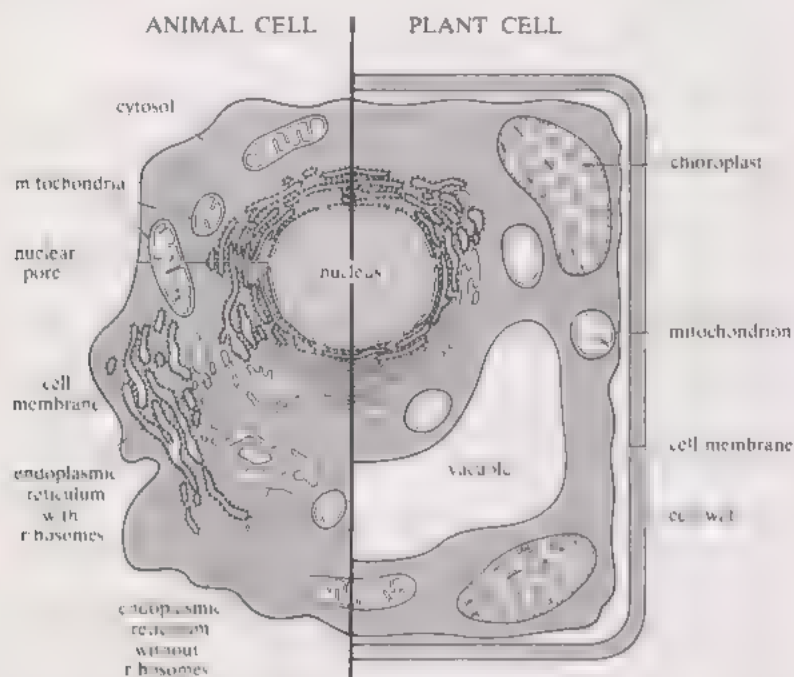
Unit 21
Genes and evolution

USEFUL INFORMATION FOR THE BIOLOGY UNITS: CHEMICALS, CELLS AND CLASSIFICATION

All cellular organisms contain these four biopolymers (made up of the monomers shown below)

Biopolymers:	polysaccharides	proteins	DNA	RNA
Monomers	monosaccharides	amino acids	deoxyribonucleotides	ribonucleotides

All eukaryotic organisms have cells of the following generalized structure



All living organisms can be divided into four kingdoms. The figures in brackets show the number of species (in thousands) in each subkingdom

Animals	Plants	Fungi	Prokaryotes
sponges (4)	eukaryotic algae (20)	slime moulds (0.5)	bacteria (1.6)
unicells (40)	true plants (330)	true fungi (100)	blue-green bacteria
multicells			(formerly termed blue-green algae)
(1 000–2 000)			(1.5)

SI02 UNITS

1	Science and the planet Earth	19	Life and evolution
2	Measuring the Solar System	20	Inheritance and cell division
3	Motion under gravity	21	Genes and evolution
4	Practical work in science	22	Biochemistry
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16	Chemical energetics	31	Quantum mechanics: atoms and nuclei
17–18	The chemistry of carbon compounds	32	The search for fundamental particles



SCIENCE



Unit 22
Biochemistry

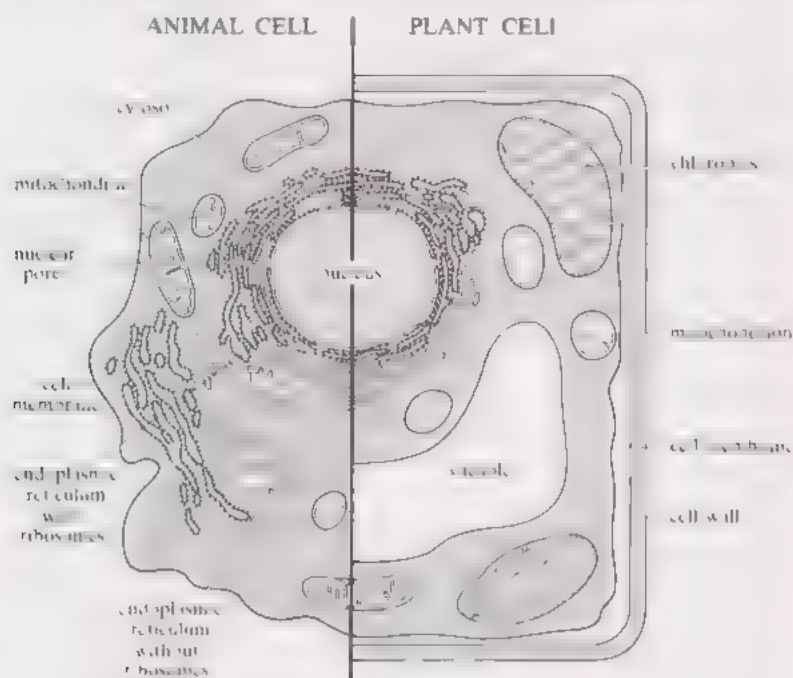
Unit 23
Physiology

USEFUL INFORMATION FOR THE BIOLOGY UNITS: CHEMICALS, CELLS AND CLASSIFICATION

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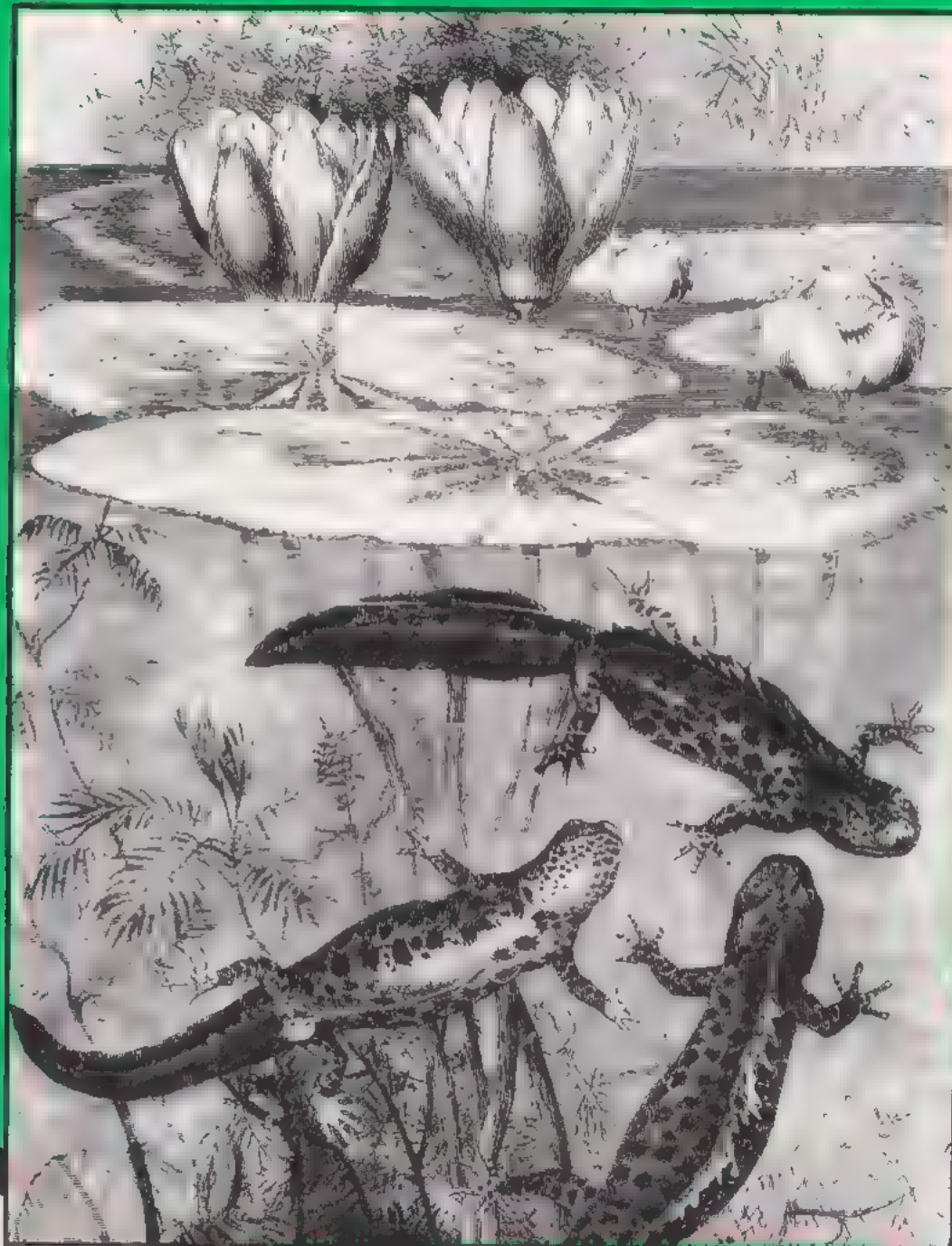
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multicells (1 000-2 000)			(1.5)

SI02 UNITS

1	Science and the planet Earth	9	Life and evolution
2	Measuring the Solar System	20	Inheritance and cell division
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SCIENCE



Unit 24
DNA: molecular
aspects of genetics

Unit 25
Ecology

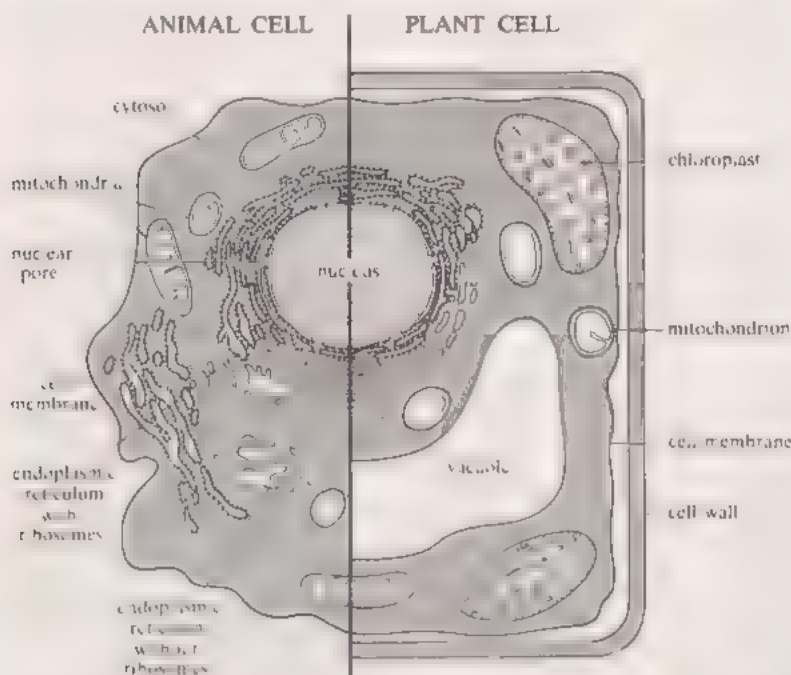
Unit 26
Biology reviewed

USEFUL INFORMATION FOR THE BIOLOGY UNITS: CHEMICALS, CELLS AND CLASSIFICATION

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Monomers:	monosaccharides	amino acids	deoxyribonucleotides	ribonucleotides

All eukaryotic organisms have cells of the following generalized structure



All living organisms can be divided into four kingdoms. The figures in brackets show the number of species (in thousands) in each subkingdom

Animals	Plants	Fungi	Prokaryotes
sponges (4)	eukaryotic algae (20)	slime moulds (0.5)	bacteria (1.6)
unicells (40)	true plants (330)	true fungi (100)	blue-green bacteria
multicells			(formerly termed blue
(1 (KK)-2 (MM))			green algae)
			(1.5)

SI02 UNITS

1	Science and the planet Earth	19	Life and evolution
2	Measuring the Solar System	20	Inheritance and cell division
3	Motion under gravity	21	Genes and evolution
4	Practical work in science	22	Biochemistry
5-6	Into the Earth: earthquakes, seismology and the Earth's magnetism	23	Physiology
7-8	Plate tectonics: a revolution in the Earth sciences	24	DNA: molecular aspects of genetics
9	Energy	25	Ecology
10	Modelling the behaviour of light	26	Biology reviewed
11-12	Atomic structure	27	Earth's internal and surface processes
13-14	Chemical reactions and the Periodic Table	28-29	Geological time and Earth history
15	Chemical equilibrium	30	Quantum mechanics: an introduction
16	Chemical energetics	31	Quantum mechanics: atoms and nuclei
17-18	The chemistry of carbon compounds	32	The search for fundamental particles



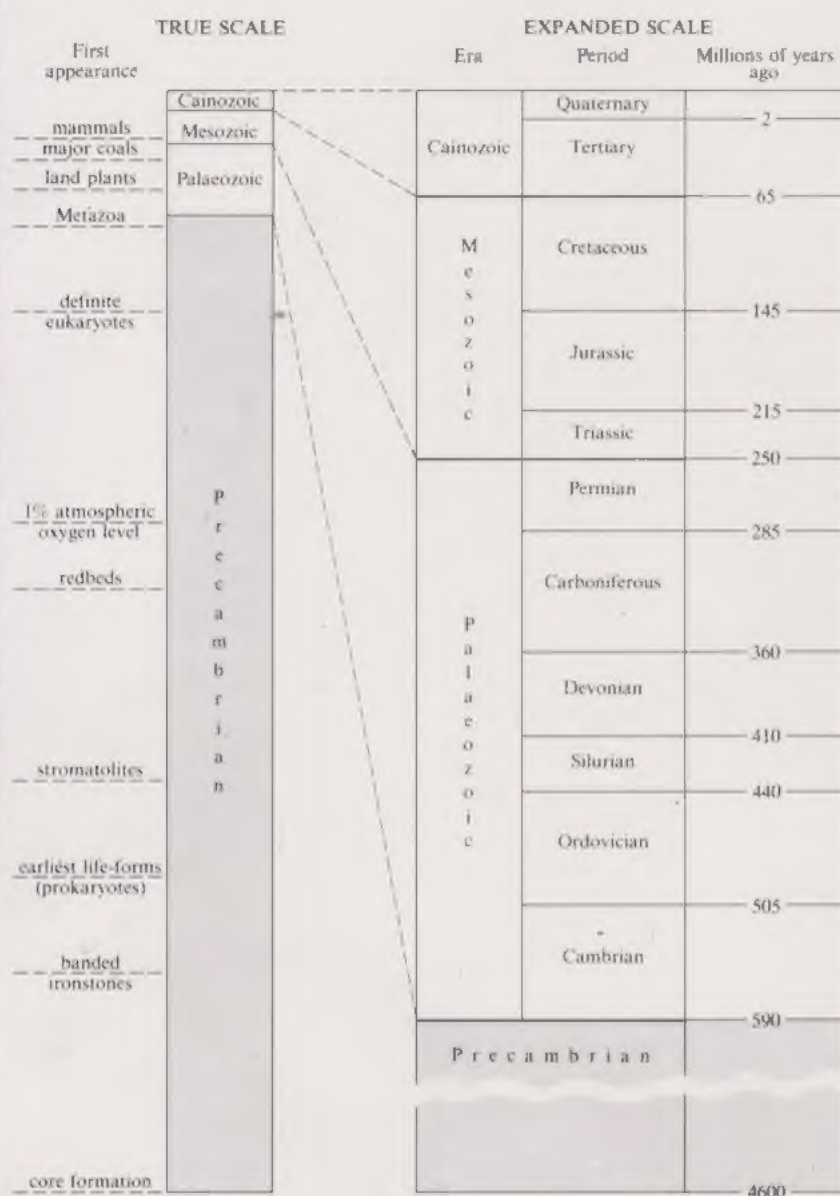
SCIENCE



Unit 27
Earth materials and processes

Units 28 – 29
Geological time and Earth history

EARTH HISTORY AND STRATIGRAPHIC COLUMN

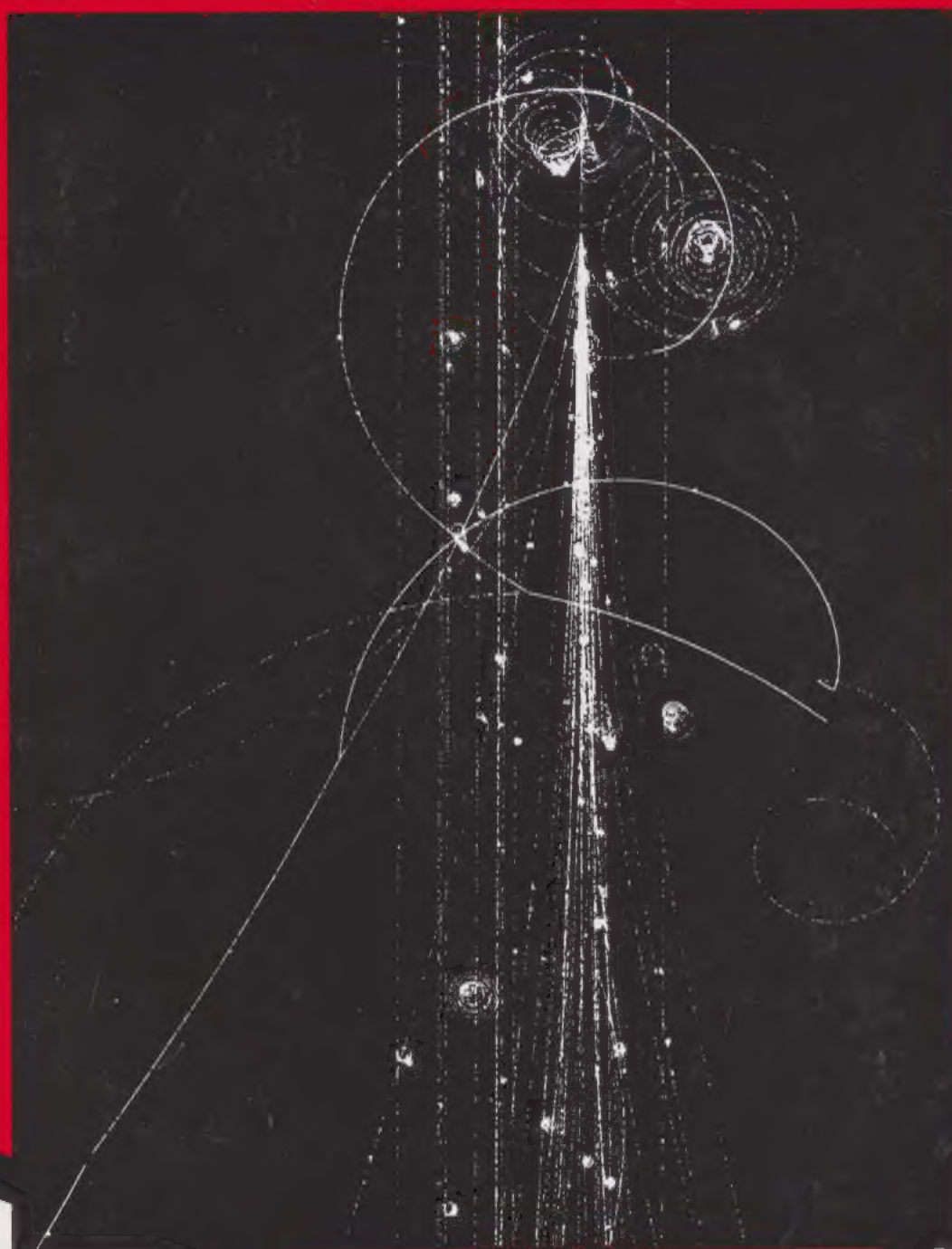


SI02 UNITS

- | | |
|---|---|
| 1 Science and the planet Earth | 19 Life and evolution |
| 2 Measuring the Solar System | 20 Inheritance and cell division |
| 3 Motion under gravity | 21 Genes and evolution |
| 4 Practical work in science | 22 Biochemistry |
| 5-6 Into the Earth: earthquakes, seismology and the Earth's magnetism | 23 Physiology |
| 7-8 Plate tectonics: a revolution in the Earth sciences | 24 DNA: molecular aspects of genetics |
| 9 Energy | 25 Ecology |
| 10 Modelling the behaviour of light | 26 Biology reviewed |
| 11-12 Atomic structure | 27 Earth materials and processes |
| 13-14 Chemical reactions and the Periodic Table | 28-29 Geological time and Earth history |
| 15 Chemical equilibrium | 30 Quantum mechanics: an introduction |
| 16 Chemical energetics | 31 Quantum mechanics: atoms and nuclei |
| 17-18 The chemistry of carbon compounds | 32 The search for fundamental particles |



SCIENCE



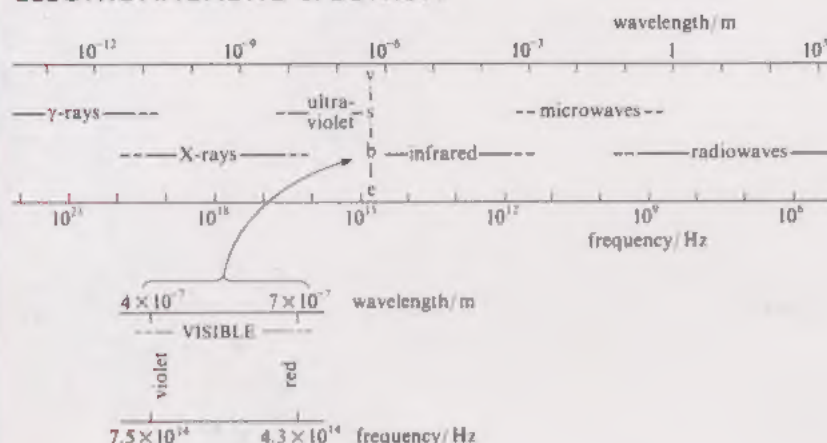
Unit 30
Quantum mechanics:
an introduction

Unit 31
Quantum mechanics:
atoms and nuclei

Unit 32
The search for fundamental particles

USEFUL INFORMATION FOR THE PHYSICS AND GENERAL SCIENCE UNITS

ELECTROMAGNETIC SPECTRUM



PHYSICAL CONSTANTS

Symbol	Quantity	Approximate value
G	gravitational constant	$6.672 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
c	speed of light in a vacuum	$2.998 \times 10^8 \text{ m s}^{-1}$
h	Planck's constant	$6.626 \times 10^{-34} \text{ J s}$
e	magnitude of the charge of the electron	$1.602 \times 10^{-19} \text{ C}$
m_e	mass of the electron	$9.110 \times 10^{-31} \text{ kg}$
m_n	mass of the neutron	$1.675 \times 10^{-27} \text{ kg}$
m_p	mass of the proton	$1.673 \times 10^{-27} \text{ kg}$

USEFUL QUANTITIES AND CONVERSIONS

$\pi \approx 3.142$	Earth radius (equatorial) $\approx 6.38 \times 10^6 \text{ m}$
1 mile $\approx 1.609 \text{ km}$	circumference of the Earth (distance round the Equator) $\approx 4.01 \times 10^7 \text{ m}$
1 kilometre (km) $\approx 0.6214 \text{ mile}$	radius of the Moon $\approx 1.74 \times 10^6 \text{ m}$
1 inch = 2.54 cm	radius of the Sun $\approx 6.96 \times 10^8 \text{ m}$
1 centimetre (cm) $\approx 0.3937 \text{ inch}$	
1 kilocalorie $\approx 4187 \text{ J}$	
1 electronvolt (eV) $\approx 1.602 \times 10^{-19} \text{ J}$	Earth-Sun distance (i.e. orbital radius of the Earth) $\approx 1.50 \times 10^{11} \text{ m}$
1 radian $\approx 57.296 \text{ degrees}$	
1 degree $\approx 0.01745 \text{ radian}$	Earth-Moon distance (i.e. orbital radius of the Moon) $\approx 3.84 \times 10^8 \text{ m}$
1 $\text{GeV}/c^2 \approx 1.783 \times 10^{-27} \text{ kg}$	

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